

COMMENTS ON THE GERBERA-COMPLEX (ASTERACEAE: MUTISIEAE)

Hans V. Hansen

*Botanic Garden
University of Copenhagen
2B Oester Farimagsgade
DK 1353 Copenhagen K, DENMARK*

ABSTRACT

The recent transfer of *Chaptalia hintonii* to *Gerbera* is doubted, as is any transfer of New World members to the Old World part of the *Gerbera*-complex. On a biogeographic basis it seems more probable that *Gerbera* is an Old World clade, while *Chaptalia*, *Trichocline*, and *T. hieracioides* (sometimes considered to be a *Gerbera*) are New World groups. The geographic distribution of *Leibnitzia* (North America, Asia) and *Amblysperma spathulata* (W. Australia) is enigmatic. Additional input of data is needed for a full understanding of the phylogeny in the *Gerbera*-complex.

RESUMEN

La reciente transferencia de *Chaptalia hintonii* a *Gerbera* es dudosa, como lo es cualquier transferencia de elementos del Nuevo Mundo a la parte del complejo *Gerbera* del Viejo Mundo. En base a la biogeografía parece más probable que *Gerbera* es un clado del Viejo Mundo, mientras que *Chaptalia*, *Trichocline*, y *T. hieracioides* (a veces considerado como una especie de *Gerbera*) son grupos del Nuevo Mundo. La distribución geográfica de *Leibnitzia* (Norte América, Asia) y *Amblysperma spathulata* (Oeste de Australia) es enigmática. Se necesitan datos adicionales para una completa comprensión de la filogenia del complejo *Gerbera*.

In recent papers, Katinas (1998, 2004b) and Nesom (2004a,b) discussed the generic position of *Chaptalia hintonii* Bullock within the *Gerbera*-complex (the scapose complex of Mutisieae subtribe Mutisiinae sensu Cabrera 1977). Their discussion continues the long-standing debate regarding OTUs within this complex. To recapitulate briefly, Jeffrey (1967) used LM to point out characters of taxonomic value in the group, mainly pertaining to cypselar pubescence and pappus-hairs. When I took up similar studies (e.g., Hansen 1985, 1990) SEM had been introduced, but my conclusions deviated little from those of Jeffrey.

Nesom (1983) contributed with his first study of the *Gerbera*-complex (American *Leibnitzia*) and next focused on *Chaptalia* Vent. (Nesom 1984a,b, 1995, 2004a,b; Cabrera & Nesom 2003), while other workers have also published studies dealing with the scapose group (Katinas 1998, 2004a,b; Sancho & Katinas 2002; Moraes 1998; Hind 1999, 2001; Roque 2005). All these studies, with their general access to living material, have amplified our knowledge about the *Gerbera*-complex.

The complex includes about 100 species, and evidently it takes subtle char-

acters to delimit monophyletic groups within it. This is noteworthy in view of its wide distribution: *Trichocline* Cass., *Lulia* Zardini, and *Chaptalia* Vent. in the New World, *Leibnitzia* Cass. in North America and Asia, *Gerbera* L. in Africa, Madagascar, and Asia (i.e., *Gerbera* sensu Hansen 1990), *Perdicium* L. in W. Cape, *Uechtrizia* Freyn in Asia, and *Amblyperma spathulata* (A. Cunn. ex DC.) D.J.N. Hind in W. Australia. It has been disputed whether *Amblyperma* falls within the limits of *Trichocline* (Hind 2001, and implicitly Hansen 1990, *contra* Zardini 1975 and Katinas 2004a), and whether the transfer of *Trichocline hieracioides* (Kunth) Ferreyra (Ecuador, Peru) to *Gerbera* by Zardini (1974) is correct. The most significant problem, however, is with *Chaptalia*, for which no complete revisionary treatment exists; Burkart (1944) only considered part of the genus in detail.

Nesom (2004a) and Katinas (2004b) remarked that while Jeffrey would split the complex into smaller genera, I suggested the recognition of one large genus (hence *Gerbera*). This calls for an explanation. The relatively ancestral position within Asteraceae of Mutisieae (however circumscribed, but at least excluding subfamily Barnadesioideae (Benth. & Hook.f.) K. Bremer & R.K. Jansen) is now supported by morphologic and molecular evidence. Of relevance here is that part of the classic Mutisiinae in all studies is indicated to be monophyletic, with the *Gerbera*-complex placed in a relatively advanced position. Actually, the Brazilian monotypic genus *Lulia* (Zardini 1980) (i.e., *Trichocline nervosa* Less.), by its monocephalous, albeit non-scapose habit, stands between the *Gerbera*-complex and its sister (a group including *Mutisia* L.f., *Chaetanthera* Ruiz & Pav., *Duidaea* S.F. Blake, and *Pachylaena* D. Don in Kim et al. 2002; *Lulia* was not considered).

In Hansen (1991), I anticipated these aspects and then reasoned that if *Mutisia* and *Chaetanthera* are not split into minor taxonomic units, it would not be logical to split the *Gerbera*-complex either, hence all species should fall within *Gerbera*. This explains my way of reasoning which was *not* versus Jeffrey (1967), but simply an alternative provided by cladistic reasoning.

Katinas (2004b:938–939) presented a key to the scapose group with seven genera (including *Lulia*, but with *Amblyperma* sunk into *Trichocline* and awaiting a complete revision of *Chaptalia*). In this key there were autapomorphies for each genus (if we accept that *Trichocline* has a special type of cypsela hairs). However, there is a complication in Katinas's key couplet 6, since *Gerbera* p.p. (sects. *Gerbera*, *Parva*, and *Isanthus*) do not have the apomorphic state 'trimorphic rays.' This is precisely where the problems with *Gerbera* (in its current sense) arise.

Nesom (2004a, cf. Nesom 1995; Cabrera & Nesom 2003) has maintained that *Chaptalia hintonii* belongs to *Chaptalia* sect. *Chaptalia*. The traits which led Katinas to move it to *Gerbera* (all florets bilabiate, outer ray florets long, ray florets with staminodes) can be found in various *Chaptalia*, and the cypsela

hairs in *C. hintonii* do not deviate in morphology from those in *Chaptalia* sect. *Chaptalia* p.p. (the *C. lyratifolia* group).

I believe that Nesom has the strongest point, namely that the 'deviating' traits in *C. hintonii* do not disrupt its alliance with *Chaptalia* sect. *Chaptalia*. Rather, *C. hintonii* possesses states which are parallelisms/reversals to those in *Gerbera*. As Nesom indirectly argues, it seems more probable on a biogeographic basis that *Gerbera* is an Old World clade, while *Chaptalia*, *Trichocline*, and the enigmatic *T. hieracioides* are New World groups (not overlooking problems with *Amblysperma* in W. Australia and *Leibnitzia*, which is divided between Asia and North America).

Evidently, various authors during their close survey of taxa detect exceptions to the currently used taxonomy and thus find reason to allocate this or that species. But the question is whether we push the case too far. We know more today than we did in Hansen (1990) and hardly disagree on the polarization of states. Hence, a matrix with all relevant placeholders in the *Gerbera*-complex treated as OTUs ultimately should be prepared, because only then it will be revealed, if the addition of new characters can disrupt the unity of (some of) the currently recognized taxonomic groups. Presumably, however, the consensus tree will still be burdened with polytomies, since the number of known synapomorphies is so small. Additional input of data is therefore much welcome. However, along with the detection of amplified variation in ray floret morphology, cypselar vestiture, etc., the selection of relevant characters may cause more and more debate. A good example is the presence of trichomes on corollas in 13 species of *Trichocline*, three of *Onoseris*, and one investigated species of *Uechtrizia* (Sancho & Katinas 2002). Is this information of phylogenetic relevance or not?

Nesom (2004a:932) has now suggested that *Chaptalia* sects. *Lieberkuhna* (Cass.) Burkart and *Loxodon* (Cass.) Burkart possibly may be separated at generic rank, among other things due to their distinctive cypselar vestiture. Katinas (2004b) likewise predicted taxonomic alterations at generic rank. The discussion between the two authors reveals considerable disagreement, both with respect to observation of characters (e.g., whether ray flower staminodes are present or not) and how to interpret their phylogenetic relevance. I must stay neutral, since I never studied *Chaptalia* in detail, but clearly the main issue is to decide whether *Chaptalia* is monophyletic (even if split into two genera), with evolution of character states parallel to those in *Gerbera*, or whether some species of *Chaptalia* really should be moved to *Gerbera* or even something else.

ACKNOWLEDGMENTS

I thank Guy Nesom and an anonymous reviewer for their most insightful comments which improved much on this paper.

REFERENCES

- BURKART, A. 1944. Estudio del género de Compuestas *Chaptalia* con especial referencia a las especies argentinas. *Darwiniana* 6:505–594.
- CABRERA, A.L. 1977. Mutisieae-systematic review. In: Heywood, V.H., J. Harborne, and B.L. Turner, eds. *The biology and chemistry of the Compositae II*. Academic Press, London. Pp. 1039–1066.
- CABRERA, L. and G.L. NESOM. 2003. A new species of *Chaptalia* (Asteraceae: Mutisieae) from Mexico and rediscovery of *Chaptalia mexicana*. *Sida* 20:1363–1369.
- HANSEN, H.V. 1985. A taxonomic revision of the genus *Gerbera* (Compositae-Mutisieae) sections *Gerbera*, *Parva*, *Piloselloides* (in Africa), and *Lasiopus*. *Opera Bot.* 78:1–36.
- HANSEN, H.V. 1990. Phylogenetic studies in the *Gerbera*-complex (Compositae, tribe Mutisieae, subtribe Mutisiinae). *Nordic J. Bot.* 9:469–485.
- HANSEN, H.V. 1991. Phylogenetic studies in Compositae tribe Mutisieae. *Opera Bot.* 109: 1–50.
- HIND, D.J.N. 1999. Notes on *Chaptalia* (Compositae: Mutisieae) in Brazil. *Kew Bull.* 54: 933–939.
- HIND, D.J.N. 2001. A new combination in *Amblysperma* (Compositae: Mutisieae). *Kew Bull.* 56:711–713.
- JEFFREY, C. 1967. Notes on Compositae: II. The Mutisieae in east tropical Africa. *Kew Bull.* 21:177–233.
- KATINAS, L. 1998. The Mexican *Chaptalia hintonii* is a *Gerbera* (Asteraceae, Mutisieae). *Novon* 8:380–385.
- KATINAS, L. 2004a. *Amblysperma* should be retained under *Trichocline* (Asteraceae, Mutisieae). *Taxon* 53:108–112.
- KATINAS, L. 2004b. The *Gerbera* complex (Asteraceae: Mutisieae): to split or not to split. *Sida* 21:935–940.
- KIM, H.G., D.J. LOOCKERMAN, and R.K. JANSEN. 2002. Systematic implications of *ndhF* sequence variation in the Mutisieae (Asteraceae). *Syst. Bot.* 27:598–609.
- MORAES, M.D. DE. 1998. *Chaptalia hermogenis* (Asteraceae: Mutisieae), a new species from the Brazilian Atlantic Rain Forest. *Novon* 8:173–175.
- NESOM, G.L. 1983. Biology and taxonomy of American *Leibnitzia* (Asteraceae, Mutisieae). *Brittonia* 35:126–139.
- NESOM, G.L. 1984a. A new, widespread species of *Chaptalia* (Asteraceae: Mutisieae) from Mexico. *Rhodora* 86:127–130.
- NESOM, G.L. 1984b. Taxonomy and distribution of *Chaptalia dentata* and *C. albicans* (Asteraceae: Mutisieae). *Brittonia* 36:396–401.
- NESOM, G.L. 1995. Revision of *Chaptalia* (Asteraceae: Mutisieae) from North America and continental Central America. *Phytologia* 78:153–188.
- NESOM, G.L. 2004a. Generic placement of *Chaptalia hintonii* (Asteraceae: Mutisieae). *Sida* 21:929–933.
- NESOM, G.L. 2004b. Response to “The *Gerbera* complex (Asteraceae: Mutisieae): to split or not to split” by Liliana Katinas. *Sida* 21:941–942.

- ROQUE, N. 2005. A new species of *Chaptalia* (Compositae, Mutisieae) from Minas Gerais, Brazil. *Kew Bull.* 60:133–135.
- SANCHO, G. and L. KATINAS, 2002. Are the trichomes in corollas of Mutisieae (Asteraceae) really twin hairs? *Bot. J. Linn. Soc.* 140:427–433.
- ZARDINI, E.M. 1974. Sobre la presencia del género *Gerbera* en America. *Bol. Soc. Argent. Bot.* 16:103–108.
- ZARDINI, E.M. 1975. Revisión del género *Trichocline* (Compositae). *Darwiniana* 19:618–733.
- ZARDINI, E.M. 1980. *Lulia* - un nuevo genero de Compuestas. *Bol. Soc. Argent. Bot.* 19: 255–258.